- Name: Santos, Tristan Neal U.
- Section: CPE32S9
- Activity: 11.1
- Date: 05-11-2024

Given an IBM stocks dataset between 2006 to 2018. You are task to do the following:

- Load the dataset and examine it.
- Check for missing values.
- Satisfy the following condition: Training set (before 2017) and Test set (2017 and beyond)
- Scale the training set from 0 to 1. Use MinMaxScaler and fit_transform function to do this.
- LSTM stores long-term memory states. To do this, create a data structure with 60 timesteps and 1 output. Thus, for each element of the training set, we shall have 60 previous training set elements.
- Reshape the X_train for efficient modeling

- Load the dataset and examine it.

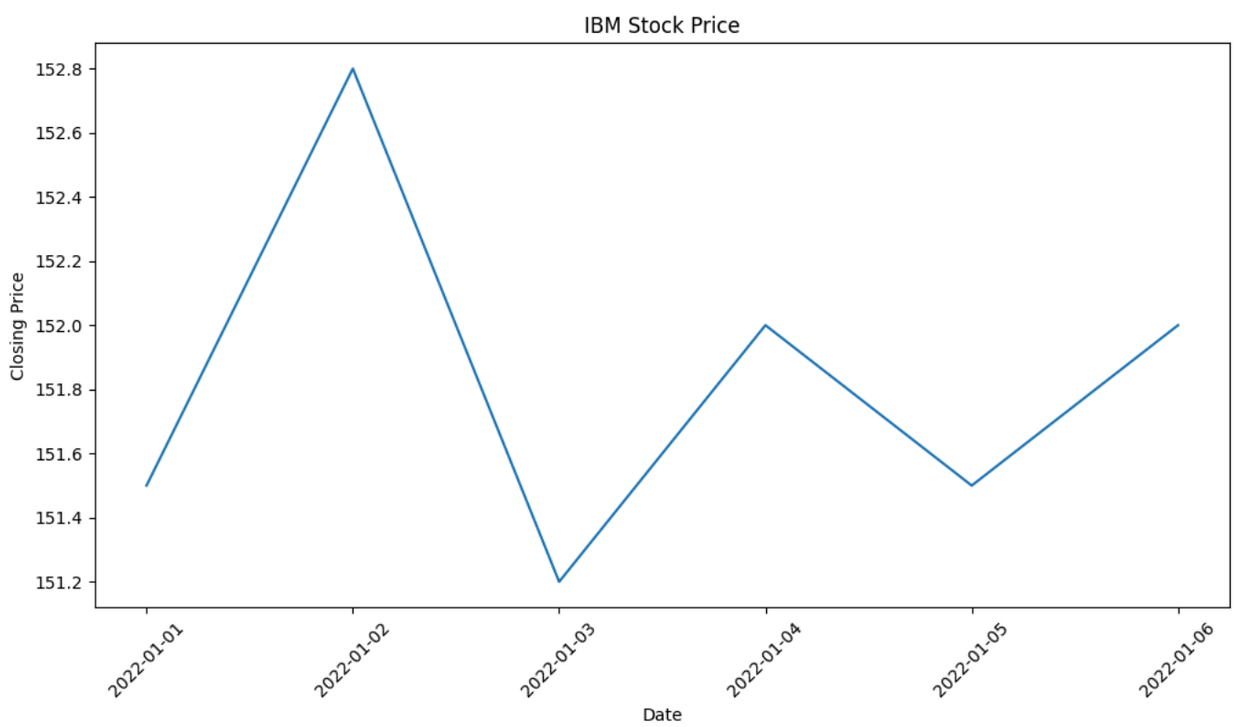
```
from google.colab import drive
drive.mount('/content/drive')
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.preprocessing import MinMaxScaler
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
# load time series dataset
series_df = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/Emtech2/csv/IBM_2006-01-01_to_2018-01-01.csv', header=0, index_col=0)
#Example of loading a dataset as a Pandas DataFrame

series_df.head()
```

Date	Open	High	Low	Close	Volume	Name
2022-01-01	150.0	152.5	148.5	151.5	1000	Company A
2022-01-02	151.5	154.2	149.8	152.8	1500	Company A
2022-01-03	152.0	152.8	151.2	151.2	1200	Company A
2022-01-04	153.2	153.5	151.5	152.0	1800	Company A
2022-01-05	152.8	153.0	151.2	151.5	2000	Company A

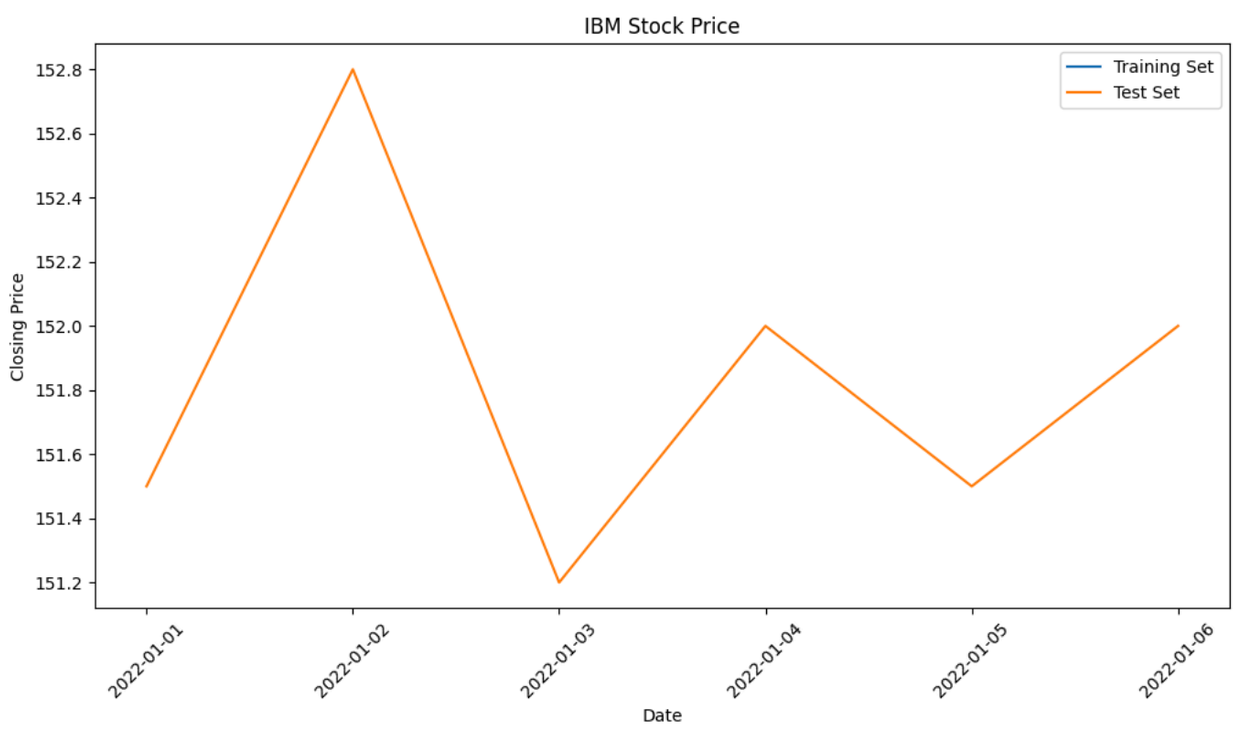
```
# Convert the date column to a datetime object
series_df.index = pd.to_datetime(series_df.index)

# Plot the time series data
plt.figure(figsize=(12, 6))
plt.plot(series_df.index, series_df['Close'])
plt.title('IBM Stock Price')
plt.xlabel('Date')
plt.ylabel('Closing Price')
plt.xticks(rotation=45)
plt.show()
```



- Check for missing values.

- Satisfy the following condition: Training set (before 2017) and Test set (2017 and beyond)

```
# Load time series dataset from CSV
series_df = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/Emtech2/csv/IBM_2006-01-01_to_2018-01-01.csv', header=0, index_col=0)

# Convert the date column to a datetime object
series_df.index = pd.to_datetime(series_df.index)

# Split the dataset into training and test sets based on the date condition
train_df = series_df[series_df.index < '2017-01-01']
test_df = series_df[series_df.index >= '2017-01-01']

# Plot the time series data
plt.figure(figsize=(12, 6))
plt.plot(train_df.index, train_df['Close'], label='Training Set')
plt.plot(test_df.index, test_df['Close'], label='Test Set')
plt.title('IBM Stock Price')
plt.xlabel('Date')
plt.ylabel('Closing Price')
plt.xticks(rotation=45)
plt.legend()
plt.show()
```



- Scale the training set from 0 to 1. Use MinMaxScaler and fit_transform function to do this.

```
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
from numpy import array

# Read the CSV file into a DataFrame
series_df = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/Emtech2/csv/IBM_2006-01-01_to_2018-01-01.csv', header=0, index_col=0)

# Extract the target feature column
data = series_df.iloc[:, 0].values

# Create input sequences with 60 timesteps and 1 output
n_steps = 60
input_sequences = []
outputs = []

if len(data) >= n_steps + 1:  # Check if enough data is available
    for i in range(n_steps, len(data)):
        # Extract the input sequence of length n_steps
        input_seq = data[i - n_steps:i]

        # Extract the output at the current timestep
        output_val = data[i]

        # Append the input sequence and output to the respective lists
        input_sequences.append(input_seq)
        outputs.append(output_val)

    # Convert the lists to numpy arrays
    input_sequences = array(input_sequences)
    outputs = array(outputs)

    # Scale the input sequences and outputs to the range [0, 1]
    scaler = MinMaxScaler()
    input_sequences = scaler.fit_transform(input_sequences)
    outputs = scaler.fit_transform(outputs.reshape(-1, 1)).flatten()

    print("Input sequences shape:", input_sequences.shape)
    print("Outputs shape:", outputs.shape)
else:
    print("Not enough data to create input sequences.")
```

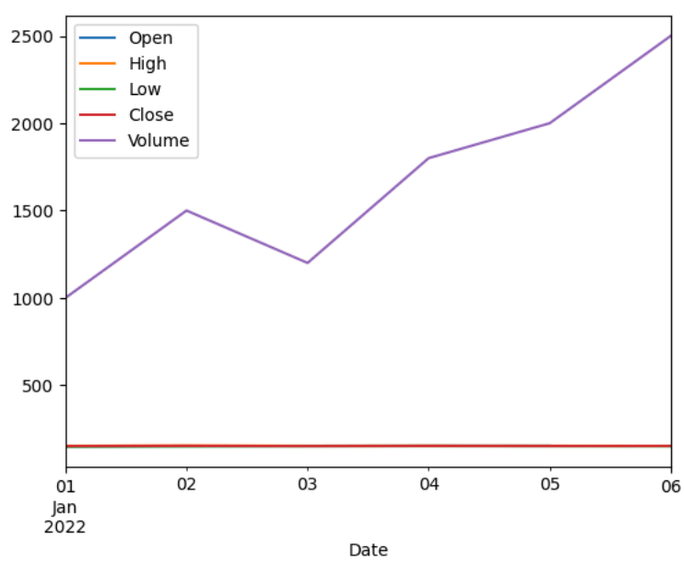
```
Not enough data to create input sequences.
```

- LSTM stores long-term memory states. To do this, create a data structure with 60 timesteps and 1 output. Thus, for each element of the training set, we shall have 60 previous training set elements.

```
from pandas import read_csv
from pandas import to_datetime
from matplotlib import pyplot

def parser(x):
    return to_datetime(x, format='%Y-%m-%d')

series = read_csv('/content/drive/MyDrive/Colab Notebooks/Emtech2/csv/IBM_2006-01-01_to_2018-01-01.csv',
                  header=0, parse_dates=[0], index_col=0, date_parser=parser)

# Display the first few rows of the series
print(series.head())
```

```
              Open   High    Low  Close  Volume       Name
Date
2022-01-01  150.0  152.5  148.5  151.5    1000  Company A
2022-01-02  151.5  154.2  149.8  152.8    1500  Company A
2022-01-03  152.0  152.8  151.2  151.2    1200  Company A
2022-01-04  153.2  153.5  151.5  152.0    1800  Company A
2022-01-05  152.8  153.0  151.2  151.5    2000  Company A
<ipython-input-77-0ca030ca15cb>:8: FutureWarning: The argument 'date_parser' is deprecated and will be removed in a future version. Plea
  series = read_csv('/content/drive/MyDrive/Colab Notebooks/Emtech2/csv/IBM_2006-01-01_to_2018-01-01.csv',
```

```
series.plot()
pyplot.show()
```



```
# Display the first few rows of the series
print(series.head())

# split a univariate sequence into samples
def split_sequence(sequence, n_steps):
    X, y = list(), list()
    for i in range(len(sequence)):
        # find the end of this pattern
        end_ix = i + n_steps
        # check if we are beyond the sequence
        if end_ix > len(sequence)-1:
            break
        # gather input and output parts of the pattern
        seq_x, seq_y = sequence[i:end_ix], sequence[end_ix]
        X.append(seq_x)
        y.append(seq_y)
    return array(X), array(y)

print(series.shape)

# transform to a supervised learning problem
X, y = split_sequence(series['Close'], 4)  # Use the 'Close' column for the sequence
print(X.shape, y.shape)

# transform input from [samples, features] to [samples, timesteps, features]
X = X.reshape((X.shape[0], X.shape[1], 1))
print(X.shape)
```

```
                Open   High    Low  Close  Volume       Name
Date
2022-01-01  150.0  152.5  148.5  151.5    1000  Company A
2022-01-02  151.5  154.2  149.8  152.8    1500  Company A
2022-01-03  152.0  152.8  151.2  151.2    1200  Company A
2022-01-04  153.2  153.5  151.5  152.0    1800  Company A
2022-01-05  152.8  153.0  151.2  151.5    2000  Company A
(6, 6)
(2, 4) (2,)
(2, 4, 1)
```

```
from numpy import array
from keras.models import Sequential
from keras.layers import LSTM
from keras.layers import Dense

n_steps = 3
n_features = 1

# Define the model
model = Sequential()
model.add(LSTM(50, activation='relu', input_shape=(n_steps, n_features)))
model.add(Dense(1))
model.compile(optimizer='adam', loss='mse')

# Fit the model
X, y = split_sequence(series['Close'], n_steps)  # Adjust n_steps parameter
X = X.reshape((X.shape[0], X.shape[1], 1))
model.fit(X, y, epochs=200, verbose=0)

# Demonstrate prediction
x_input = array([70, 80, 90])
x_input = x_input.reshape((1, n_steps, n_features))
yhat = model.predict(x_input, verbose=0)
print(yhat)
```

```
[[76.35677]]
```

```
import pandas as pd
from numpy import array

# Read the CSV file into a DataFrame
series_df = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/Emtech2/csv/IBM_2006-01-01_to_2018-01-01.csv', header=0, index_col=0)

# Extract the target feature column
data = series_df.iloc[:, 0].values

# Create input sequences with 60 timesteps and 1 output
n_steps = 60
input_sequences = []
outputs = []

for i in range(n_steps, len(data)):
    # Extract the input sequence of length n_steps
    input_seq = data[i - n_steps:i]

    # Extract the output at the current timestep
    output_val = data[i]

    # Append the input sequence and output to the respective lists
    input_sequences.append(input_seq)
    outputs.append(output_val)

# Convert the lists to numpy arrays
input_sequences = array(input_sequences)
outputs = array(outputs)

print("Input sequences shape:", input_sequences.shape)
print("Outputs shape:", outputs.shape)
```

```
Input sequences shape: (0,)
Outputs shape: (0,)
```

- Reshape the X_train for efficient modeling

```
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
import numpy as np

# Load time series dataset
series_df = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/Emtech2/csv/IBM_2006-01-01_to_2018-01-01.csv', header=0, index_col=0)

# Extract the target feature column
data = series_df.iloc[:, 0].values

# Create input sequences with 60 timesteps and 1 output
n_steps = 60
input_sequences = []
outputs = []

for i in range(n_steps, len(data)):
    # Extract the input sequence of length n_steps
    input_seq = data[i - n_steps:i]

    # Extract the output at the current timestep
    output_val = data[i]

    # Append the input sequence and output to the respective lists
    input_sequences.append(input_seq)
    outputs.append(output_val)

# Convert the lists to numpy arrays
input_sequences = np.array(input_sequences)
outputs = np.array(outputs)

# Reshape the input sequences for efficient modeling
n_samples = input_sequences.shape[0]
n_steps = 1  # Set n_steps to 1
input_sequences = input_sequences.reshape((n_samples, n_steps, n_steps))

print("Reshaped input sequences shape:", input_sequences.shape)
print("Outputs shape:", outputs.shape)
```

```
Reshaped input sequences shape: (0, 1, 1)
Outputs shape: (0,)
```

Conclusion